

patrol every inch of road like they were providing the Coliseum with virgins; merely stopping is forbidden. Permits to collect, survey, or just watch the wildlife are very nearly unobtainable: they don't want you spotting anything endangered, the existence of which could be cause for limiting the absolute control the tribe enjoys on its land. The endemic *Euphydryas anicia claudcrofti* Ferris and R Holland, is known right up to the reservation line, but there is not one report from on the reservation anywhere in the public domain. The only person I ever knew to negotiate successfully to collect on the Mescalero Reservation posed *au natural* for a tribal art class in exchange.

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Carnegie are paratypes, the holotype in the latter institution.

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Use of *Hippuris*, an emergent aquatic plant, as a larval host by the buckeye, *Junonia coenia*, in Northern California

Recent advances in DNA-sequence-based phylogeny have radically altered botanists' concepts of the relationships within the old family Scrophulariaceae and between the now-disaggregated components of that family and others previously classified in a variety of ways (Olmstead *et al.*, 2001; Kadereit *in* Kubitzki & Kadereit, 2004). In addition to DNA evidence, the distribution of characteristic secondary phytochemicals affords a partially-independent indication of plant relationships. In that vein, host-plant choices by oligophagous insects may

suggest underlying chemical, and thus potentially phylogenetic, affinities among the taxa involved. The chemical basis for host selection in various Melitaeini (Nymphalidae) is the presence of the bitter compounds called iridoid glycosides (Bowers & Puttick, 1986; Gardner & Sternitz, 1988). Shapiro and Hertfelder (2009) recently reported the iridoid-selecting variable checkerspot, *Euphydryas chalcedona*, feeding spontaneously, repeatedly and successfully on the exotic garden shrub butterfly bush, *Buddleja davidii*, historically placed in the Loganiaceae or its own family Buddleiaceae but now incorporated into Scrophulariaceae.

The common buckeye, *Junonia coenia* is also a Nymphalid but not a Melitacine, and its host range in California embraces Scrophulariaceae, the very

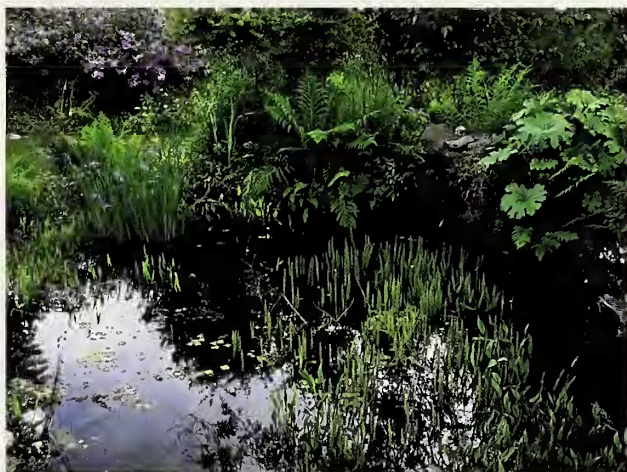


Figure 1. The Biggs garden pond. Emergent stand of mare's tail at right.



Figure 2. Two buckeye larvae, *Junonia coenia*, feeding on mare's tail *in situ*.

closely-related Plantaginaceae, and the genus *Phyla* (= *Lippia*) in the Verbenaceae (Shapiro & Manolis, 2007). The chemical basis for host selection in this species has been shown to involve the presence of iridoid glycosides (Bowers, 1984) although the story must be more complicated insofar as some Verbenaceous genera known to produce iridoids, such as *Lantana* (Rimpler & Sauerbier, 1986) are common in buckeye environments but never utilized.

Mare's tail, *Hippuris vulgaris*, is an emergent aquatic flowering plant with a superficial resemblance to a horsetail (Equisetaceae); it is widely distributed in the cooler parts of both North and South America but rather rare and local in California where, however, it is occasionally grown in garden ponds. It has been classified in the monotypic family Hippuridaceae, whose affinities have been obscure until recently although several authors placed it near the Scrophulariaceae. Iridoid glycosides were reported in mare's tail by the pioneering phytochemist Hegnauer in the 1970s and confirmed by Damtoft *et al.* (1994). Their importance for plant systematics was emphasized by Jensen *et al.* (1975) and El-Naggar and Beal (1980). Grayer *et al.* (1999) noted the convergence of phytochemical and molecular-phylogenetic data in the group of families around Scrophulariaceae, and subsequent authors have treated Hippuridaceae as a member of the "Scroph" clade (Kadereit, 2004).

Given these facts it was not completely surprising when one of us (KB) found common buckeye larvae feeding on mare's tail in her home pond at Sebastopol, CA (see photo)—twice in the pond's 12-year existence. We subsequently learned that Mr. Michael Koslosky found buckeye larvae on the same plant "about ten years ago while shopping at Connie's Pond Supply in Castro Valley [CA]" and reared them out successfully on it (M. Koslosky, pers. comm.). This is the only emergent aquatic plant known to be a buckeye host. It is not clear whether a larva can complete development on a single shoot or has to access an adjacent one at least once in its development; KB has seen them use downed stems as "bridges." The stems are tall enough to permit pupation and eclosion well above the water line.

The distribution of iridoid glycosides is such that many other plants not known to be buckeye hosts are potentially usable. One of us (AMS), based on the confirmed presence of iridoids in princess tree, *Paulownia* (Bignoniaceae) foliage (Lino von Poser *et al.*, 2000), has on several occasions confined buckeye females on it, obtained eggs easily, and reared the larvae through to the adult on it. The same is true on

both *Catalpa speciosa* and *C. bignonioides* (currently but shakily placed in Bignoniaceae or Scrophulariaceae), which also produce iridoids (Sha'ban *et al.*, 1980; Iwaga *et al.*, 1991). All of these are trees, and there are no records of the common buckeye using any tree as a host. However, the tropical buckeye, *Junonia genoveva*, feeds on black mangrove, *Avicennia* (Avicenniaceae, sometimes put in Verbenaceae) and occasionally on *Lippia* (Scott, 1986), and these are iridoid producers. There is a suggestion that host selection by these butterflies is mediated by both apparency (growth form) and, at close range, iridoid chemistry. Clearly, we have a lot to learn.

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